## REMARKS

Claims 1-23 and 25-44 remain in the application. The applicant has cancelled claim 24 and added claim 45.

The office action objects to the drawings because reference numeral 340 is used to designate different features in figures 3 and 5. In response, the applicant encloses a corrected drawing sheet showing the change in Figure 3 of reference numeral 340 to 335.

**Claim Rejections - 35 U.S.C. 121**

The applicant has amended claim 27 by inserting the words "into the dielectric body" after the word "extends".

**Claim Rejections - 35 U.S.C. 102**

The office action rejects claims 1-6 and 13-20 as being anticipated by Carl et al.

The applicant respectfully disagrees with the analysis of Carl et al. and the conclusions presented in the office action for the following reasons:

Carl discloses two different kinds of applicators, one shown in Figure 2 comprises a waveguide with a beveled end, and the other shown in Figure 3 shows an applicator with an antenna 314 surrounded by a body of dielectric material 316. Therefore, if we are comparing Carl with the invention, only the embodiment of Figure 3 is relevant. If we then consider whether Figure 3 conforms with the invention in terms of performance, as the office action suggests, then the only information we have is that the applicator preferably operates at lower frequencies from 2Ghz to 25 or 30 Ghz and the dielectric comprises an insulating material such as Teflon LR. From this information, a skilled person could work out the extent of the near-field radiation if they assume a value for the length 322 of the antenna

314. Carl says that the length 322 is related to the frequency (column 16, lines 7-8) but does not explain this relationship or give any absolute length values. If one could determine a length value, this would allow one to calculate the extent of the near-field radiation using the formula $2L^2/P$ as explained in the present application, but this would still not allow one to determine whether the calculated extent of the near-field brings this within the actual dimensions of the dielectric body 316 since we do not have any information about the diameter of the applicator. It would still be impossible, therefore, to decide whether or not the applicator of Figure 3 complies with claim 1.

The office action notes that Carl describes the applicator of Figure 2 as having a diameter of about 2mm, but there is no reason why data relating to Figure 2 should be read over onto the design of Figure 3.

Carl does not therefore disclose the extent to which the near field might lie within the body 316 in Figure 3. Carl does not refer to the near field at all, and certainly does not disclose the body 316 encompassing substantially the whole of the near field radiation emitted by the antenna 314. Accordingly, the applicant maintains that Carl does not anticipate claim 1.

Furthermore, Carl does not disclose anything to teach the invention. Carl does not suggest the use of materials with high dielectric constants such as would be suitable for the purpose of field encapsulation by reducing the extent of the near-field. Carl only teaches the use of Teflon, the dielectric constant of which would be too low to fully encompass the near field as required in this invention. The normal reasons for using a high dielectric constant would be to reduce the size of a device or to improve wave-matching at interfaces. Neither of these issues is related to near-field penetration into tissue, which is the underlying technical problem to overcome in this invention. Furthermore, Carl does not teach that the length 322 of the antenna is especially relevant, other than just that it is related to the operating frequency, and certainly Carl is silent about the affect of the antenna length 322 on the extent of the near-field.

The benefits of encompassing the near field in this invention are two-fold, namely:

(a) by reducing the rate at which the tissue becomes dehydrated which minimizes any risk of charring to the body tissue under treatment; and

(b) by reducing the amount of energy dissipated within the near field, to increase the amount of energy to the far field, permitting increased energy efficiency to the far field.

It is known and accepted that antenna devices generate a near-field, consisting of large field amplitudes which exist quasi-statically in the local region of the antenna. These large field amplitudes do not radiate energy but if the region in which the near field exists is not air, but contains highly lossy biological matter, these near field amplitudes will generate heat.

By excluding lossy biological material from the region occupied by the near fields with the use of materials with high dielectric constants, as disclosed in the invention, the stability and efficiency of the device as the tissue heats up is substantially improved. This is because desiccation of tissue in the far-field occurs much slower at higher power levels than would be the case if tissue were present in the intense near-field region. Desiccation of tissue causes an alteration of the loss tangent which in turn affects the microwave match of the device, causing reflections. The invention minimises the effect of tissue heating caused by these reflections. By overcoming this technical problem, the input impedance of the device is more stable so that greater energy can be applied resulting in deeper energy penetration into the tissue.

Claim 1 of the application specifies that the dielectric body surrounding the antenna be dimensioned to encompass the near field radiation. The term "near field" is well known to workers in this field. In essence, the radiation pattern around an antenna divides

into two portions, the near field (adjacent the antenna) and the far field (further from the antenna).

The newly added claim 45 further specifies the inter-relatedness of the length of the antenna and the dielectric constant of the dielectric body and its dimensions relative to the antenna, these parameters being selected in relation to the intended operating frequency of the device so that the dielectric body encompasses the near-field radiation. It is only by making an appropriate selection of these parameters that it is possible to provide a device which avoids excess heating in the near-field and ensures deeper energy penetration in body tissue in the far-field. Claim 45 is patentable over the prior art of record because the combination of features disclosed in the claim is neither disclosed nor suggested in the prior art.

In summary, the cited reference does not mention the near-field, let alone disclose or suggest the concept of dimensioning the dielectric body to encapsulate the near field. The invention is based on the realization that if one prevents energy transferral from the antenna in its near field zone, then a greater proportion of the antenna's energy is available to be transferred via the far field region. To achieve this result, the invention provides that the dielectric encompasses the near field zone, meaning that the antenna's energy cannot then be coupled into its surroundings (living tissue, for example) via the near field. By providing that the energy is coupled into the antenna's surroundings via the far field, the invention enables effective coupling of the antenna's energy into regions distant from the antenna. This result is useful when, for example, placing the device within a body cavity to treat body regions adjacent the cavity.

**The Examiner rejects claims 23-35 and 38-43 as being anticipated by Berube.**

In response to this objection the applicant has amended claims 23 to include limitations of claim 24. The applicant has cancelled claim 24.

The applicant has also amended claim 38 to include further limitations more clearly defining over the prior art of record.

Berube discloses a microwave horn device in which the tip portion increases in diameter towards a flat end. The flared horn is filled with a dielectric material 30 composed of:

"*a silicone and Teflon composite, although other suitable materials may be used as well such as ceramic powder, polyethylene and polyolifin*"(column 7 lines 60-62).

The face of the dielectric material 30 is flush with the open end of the horn defined by the outer conductor 16. Figure 3 illustrates the manner in which radiation emitted by the antenna 17 is transmitted forwards by internal reflections with the outer wall 16 of the horn.

In contrast, the invention as now defined in the amended claims 23 and 38 does not relate to a microwave horn device at all, but a device in which the dielectric body surrounding the antenna at its tip is shaped so as to extend axially beyond the antenna and terminate in a rounded tip with a cross section that reduces from the antenna to the tip. This tapering characteristic of the rounded dielectric tip is the very opposite of the flared characteristic of the microwave horn device of Berube, which increases in cross section towards the tip.

As regards the Examiner's objection to the claims dependent from claims 23 and 38, these no longer seem relevant in view of the amendments to the independent claims. However, the applicant respectfully disagrees with the interpretation of "substantially" as set forth in the office action, i.e., where the office action indicates that the word "substantially" covers variations within a factor of 10. The applicant maintains that this is inconsistent with normal English usage.

**Claim 44 is rejected as anticipated by Kasevich et al.**

The applicant respectfully disagrees with the analysis and conclusions set forth in the office action for the following reasons:

Kasevich is principally concerned with the treatment of prostate cancer and a device intended to be inserted into a patient without making an incision. However, it does state:

"*also while Figure 5 shows the use of a plurality of microwave antenna devices introduced through the urinary bladder and rectum for treatment of the prostate, similar methods can be used in other areas of the body, for example, the liver or kidneys*"(bottom of column 15 line 63-67).

However, the device illustrated in Figure 5 is fitted with an inflatable balloon 203 at its tip (column 9 lines 24-39). There is no description as to how the device of Figure 5 might be used to treat a liver. Although the tip is fitted with a component 203 which appears to be pointed, this is in fact an inflatable balloon, and is not intended to make an incision in an organ such as a liver. We therefore submit that Kasevich does not anticipate claim 1 nor render it obvious.

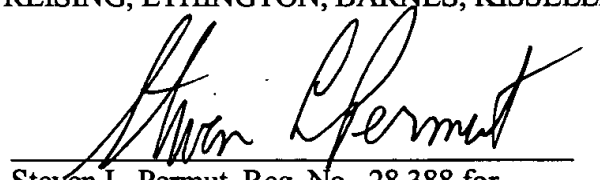
**Allowable subject matter**

The applicant acknowledges with thanks the examiner's finding that claims 7-12, 21, 22, 36, and 37 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The applicant will consider rewriting these claims should the base claims that they currently depend from not eventually be allowed.

I authorize the Commissioner to change any deficiencies, or credit any overpayment associated with this communication, to Deposit Account No. 59-0852. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

REISING, ETHINGTON, BARNES, KISSELLE, P.C.



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